Handyscope HS3

Instrument manual

Rev. 2.1

TiePie engineering

ATTENTION!

Measuring directly on the **line voltage** can be very dangerous.
The **outside** of the **BNC connectors** at the Handyscope HS3 are connected with the **ground** of the computer.
Use a good isolation transformer or a differential probe when measuring at the **line voltage** or at **grounded power supplies**! A short-circuit current will flow if the **ground** of the Handyscope HS3 is connected to a positive voltage. This short-circuit current can damage both the Handyscope HS3 and the computer.

Despite the care taken for the compilation of this user manual, TiePie engineering can not be held responsible for any damages resulting from errors that may appear in this book.
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Contents

1 Safety **1**

2 Declaration of confirmity **3**

3 Introduction **5**
3.1 Sampling 6
3.2 Sample frequency 7
3.2.1 Aliasing 7
3.3 Digitizing 9
3.4 Signal coupling 10
3.5 Probe compensation 10

4 Driver installation **13**
4.1 Introduction 13
4.2 Where to find the driver setup 13
4.3 Executing the installation utility 13

5 Hardware installation **19**
5.1 Power the instrument 19
5.1.1 External power 19
5.2 Connect the instrument to the computer 20
5.2.1 Found New Hardware Wizard 21
5.3 Plug into a different USB port 23

6 Front panel **25**
6.1 CH1 and CH2 input connectors 25
6.2 GENERATOR output connector 25
6.3 Power indicator 25

7 Rear panel **27**
7.1 Power 27
7.1.1 USB power cable 28
7.1.2 Power adapter 29
7.2 USB 29
7.3 Extension Connector 29

8 Specifications **31**
8.1 Acquisition system 31

8.2 BNC inputs Ch1, Ch2 31
8.3 Trigger system 32
8.4 Arbitrary Waveform Generator 32
8.5 Interface 32
8.6 Power 33
8.7 Physical 33
8.8 I/O connectors 33
8.9 System requirements 33
8.10 Operating environment 33
8.11 Storage environment 33
8.12 Certifications and Compliances 34
8.13 Package 34

Safety

1

When working with electricity, no instrument can guarantee complete safety. It is the responsibility of the person who works with the instrument to operate it in a save way. Maximum security is achieved by selecting the proper instruments and following save working procedures. Save working tips are given below:

- Always work according (local) regulations.
- Work on installations with voltages higher than 25 V AC or 60 V DC should only be performed by qualified personnel.
- Avoid working alone.
- Observe all indications on the Handyscope HS3 before connecting any wiring
- Check the probes/test leads for damages. Do **not** use them if they are damaged
- Take care when measuring at voltages higher than 25V AC or 60 V DC.
- Do not operate the equipment in an explosive atmosphere or in the presence of flammable gases or fumes.
- Do not use the equipment if it does not operate properly. Have the equipment inspected by qualified service personal. If necessary, return the equipment to TiePie engineering for service and repair to ensure that safety features are maintained.
- Measuring directly on the **line voltage** can be very dangerous. The **outside** of the **BNC connectors** at the Handyscope HS3 are connected with the **ground** of the computer. Use a good isolation transformer or a differential probe when measuring at the **line voltage** or at **grounded power supplies**! A short-circuit current will flow if the **ground** of the Handyscope HS3 is connected to a positive voltage. This short-circuit current can damage both the Handyscope HS3 and the computer.

Declaration of confirmity

TiePie engineering
Koperslagersstraat 37
8601 WL Sneek
The Netherlands

EC Declaration of confirmity

We declare, on our own responsibility, that the product

Handyscope HS3-5MHz
Handyscope HS3-10MHz
Handyscope HS3-25MHz
Handyscope HS3-50MHz
Handyscope HS3-100MHz

for which this declaration is valid, is in compliance with

EN 55011:2009/A1:2010	EN 61000-6-1:2007
EN 55022:2006/A1:2007	EN 61000-6-3:2007

according the conditions of the EMC standard 2004/108/EC.

Sneek, 1-11-2010

ir. A.P.W.M. Poelsma

Introduction 3

Before using the Handyscope HS3 first read chapter 1 about safety.

Many technicians investigate electrical signals. Though the measurement may not be electrical, the physical variable is often converted to an electrical signal, with a special transducer. Common transducers are accelerometers, pressure probes, current clamps and temperature probes. The advantages of converting the physical parameters to electrical signals are large, since many instruments for examining electrical signals are available.
The Handyscope HS3 is a portable two channel measuring instrument with Arbitrary Waveform Generator. The Handyscope HS3 is available in several models with different maximum sampling frequencies: 5 MS/s, 10 MS/s, 25 MS/s, 50 MS/s or 100 MS/s. The native resolution is 12 bits, but user selectable resolutions of 8, 14 and 16 bits are available too, with adjusted maximum sampling frequency:

resolution	Maximum sampling frequency
8 bit	100 MS/s
12 bit	5, 10, 25 or 50 MS/s, depending on model
14 bit	3.125 MS/s
16 bit	195 kS/s

Table 3.1: Maximum sampling frequencies

With the accompanying software the Handyscope HS3 can be used as an oscilloscope, a spectrum analyzer, a true RMS voltmeter or a transient recorder. All instruments measure by sampling the input signals, digitizing the values, process them, save them and display them.

3.1 Sampling

When sampling the input signal, samples are taken at fixed intervals. At these intervals, the size of the input signal is converted to a number. The accuracy of this number depends on the resolution of the instrument. The higher the resolution, the smaller the voltage steps in which the input range of the instrument is divided. The acquired numbers can be used for various purposes, e.g. to create a graph.

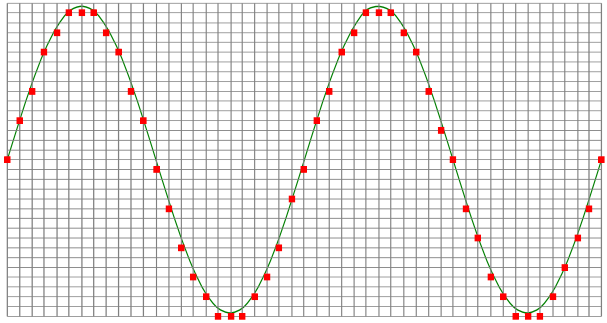

Figure 3.1: Sampling

The sine wave in figure 3.1 is sampled at the dot positions. By connecting the adjacent samples, the original signal can be reconstructed from the samples. You can see the result in figure 3.2.

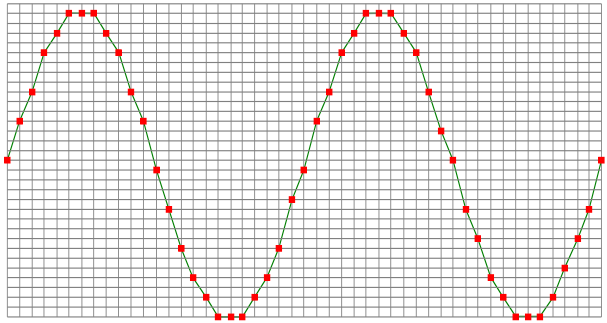

Figure 3.2: "connecting" the samples

3.2 Sample frequency

The rate at which the samples are taken is called the **sampling frequency**, the number of samples per second. A higher sampling frequency corresponds to a shorter interval between the samples. As is visible in figure 3.3, with a higher sampling frequency, the original signal can be reconstructed much better from the measured samples.

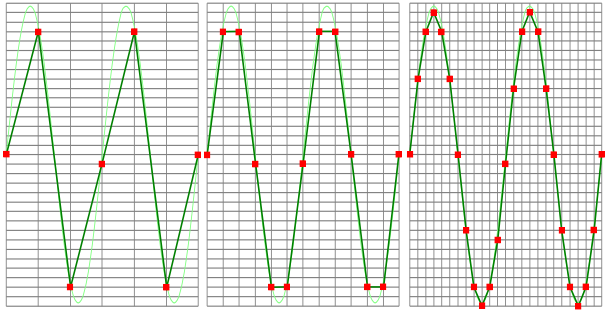

Figure 3.3: The effect of the sampling frequency

The sampling frequency must be higher than 2 times the highest frequency in the input signal. This is called the **Nyquist frequency**. Theoretically it is possible to reconstruct the input signal with more than 2 samples per period. In practice, 10 to 20 samples per period are recommended to be able to examine the signal thoroughly.

3.2.1 Aliasing

When sampling an analog signal with a certain sampling frequency, signals appear in the output with frequencies equal to the sum and difference of the signal frequency and multiples of the sampling frequency. For example, when the sampling frequency is 1000 Hz and the signal frequency is 1250 Hz, the following signal frequencies will be present in the output data:

Multiple of sampling frequency	1250 Hz signal	-1250 Hz signal
...		
-1000	-1000 + 1250 = **250**	-1000 - 1250 = -2250
0	0 + 1250 = 1250	0 - 1250 = -1250
1000	1000 + 1250 = 2250	1000 - 1250 = -250
2000	2000 + 1250 = 3250	2000 - 1250 = 750
...		

Table 3.2: Aliasing

As stated before, when sampling a signal, only frequencies lower than half the sampling frequency can be reconstructed. In this case the sampling frequency is 1000 Hz, so we can we only observe signals with a frequency ranging from 0 to 500 Hz. This means that from the resulting frequencies in the table, we can only see the 250 Hz signal in the sampled data. This signal is called an **alias** of the original signal.
If the sampling frequency is lower than twice the frequency of the input signal, **aliasing** will occur. The following illustration shows what happens.

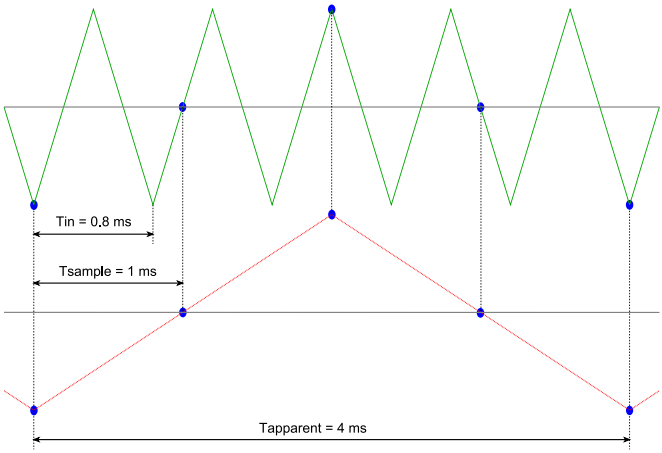

Figure 3.4: Aliasing

In figure 3.4, the green input signal (top) is a triangular signal with a frequency of 1.25 kHz. The signal is sampled with a frequency of 1 kHz. The corresponding sampling interval is 1/1000Hz = 1ms.

The positions at which the signal is sampled are depicted with the blue dots. The red dotted signal (bottom) is the result of the reconstruction. The period time of this triangular signal appears to be 4 ms, which corresponds to an apparent frequency (alias) of 250 Hz (1.25 kHz - 1 kHz).

To avoid aliasing, always start measuring at the highest sampling frequency and lower the sampling frequency if required.

3.3 Digitizing

When digitizing the samples, the voltage at each sample time is converted to a number. This is done by comparing the voltage with a number of levels. The resulting number is the number corresponding to the level that is closest to the voltage. The number of levels is determined by the resolution, according to the following relation: $LevelCount = 2^{Resolution}$.
The higher the **resolution**, the more levels are available and the more accurate the input signal can be reconstructed. In figure 3.5, the same signal is digitized, using two different amounts of levels: 16 (4-bit) and 64 (6-bit).

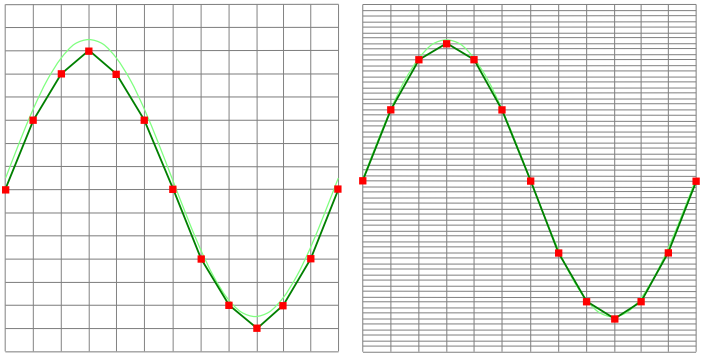

Figure 3.5: The effect of the resolution

The Handyscope HS3 measures at e.g. 12 bit resolution (2^{12}=4096 levels). The smallest detectable voltage step depends on the input

range. This voltage can be calculated as:

$VoltageStep = FullInputRange/LevelCount$

For example, the 200 mV range ranges from -200 mV to +200 mV, therefore the full range is 400 mV. This results in a smallest detectable voltage step of 0.400V/4096 = 97.65 μV.

3.4 Signal coupling

The Handyscope HS3 has two different settings for the signal coupling: AC and DC. In the setting DC, the signal is directly coupled to the input circuit. All signal components available in the input signal will arrive at the input circuit and will be measured.
In the setting AC, a capacitor will be placed between the input connector and the input circuit. This capacitor will block all DC components of the input signal and let all AC components pass through. This can be used to remove a large DC component of the input signal, to be able to measure a small AC component at high resolution.

When measuring DC signals, make sure to set the signal coupling of the input to DC.

3.5 Probe compensation

The Handyscope HS3 is shipped with a probe for each input channel. These are 1x/10x selectable passive probes. This means that the input signal is passed through directly or 10 times attenuated.

When using an oscilloscope probe in 1:1 the setting, the bandwidth of the probe is only 6 MHz. The full bandwidth of the probe is only obtained in the 1:10 setting

The x10 attenuation is achieved by means of an attenuation network. This attenuation network has to be adjusted to the oscilloscope input circuitry, to guarantee frequency independency. This

is called the low frequency compensation. Each time a probe is used on an other channel or an other oscilloscope, the probe must be adjusted.
Therefore the probe is equiped with a setscrew, with which the parallel capacity of the attenuation network can be altered. To adjust the probe, switch the probe to the x10 and attach the probe to a 1 kHz square wave signal. Then adjust the probe for a square front corner on the square wave displayed. See also the following illustrations.

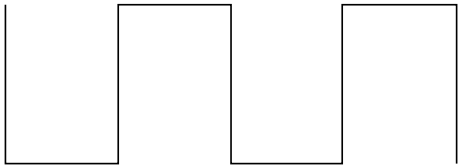

Figure 3.6: correct

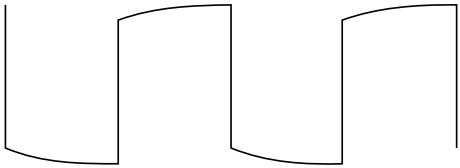

Figure 3.7: under compensated

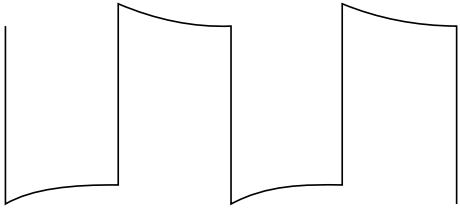

Figure 3.8: over compensated

Driver installation

Before connecting the Handyscope HS3 to the computer, the drivers need to be installed.

4.1 Introduction

To operate a Handyscope HS3, a driver is required to interface between the measurement software and the instrument. This driver takes care of the low level communication between the computer and the instrument, through USB. When the driver is not installed, or an old, no longer compatible version of the driver is installed, the software will not be able to operate the Handyscope HS3 properly or even detect it at all.
The installation of the USB driver is done in a few steps. Firstly, the driver has to be pre-installed by the driver setup program. This makes sure that all required files are located where Windows can find them. When the instrument is plugged in, Windows will detect new hardware and install the required drivers.

4.2 Where to find the driver setup

The driver setup program and measurement software can be found in the download section on TiePie engineering's website and on the CD-ROM that came with the instrument. It is recommended to install the latest version of the software and USB driver from the website. This will guarantee the latest features are included.

4.3 Executing the installation utility

To start the driver installation, execute the downloaded driver setup program, or the one on the CD-ROM that came with the instrument. The driver install utility can be used for a first time

installation of a driver on a system and also to update an existing driver.
The screen shots in this description may differ from the ones displayed on your computer, depending on the Windows version.

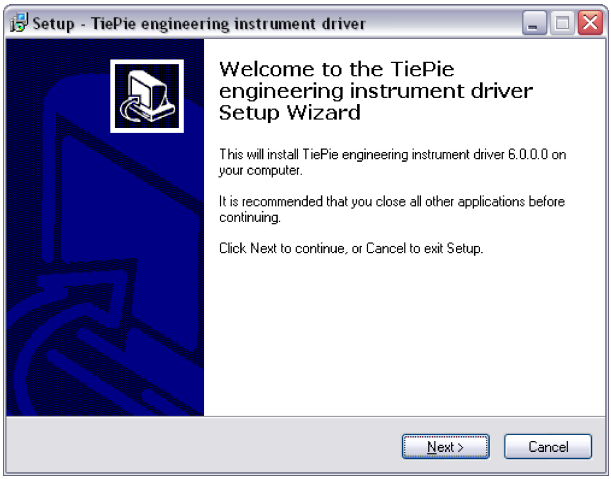
Setup - TiePie engineering instrument driver
Welcome to the TiePie engineering instrument driver Setup Wizard
This will install TiePie engineering instrument driver 6.0.0.0 on your computer.
It is recommended that you close all other applications before continuing.
Click Next to continue, or Cancel to exit Setup.
Next >
Cancel

Figure 4.1: Driver install: step 1

When drivers were already installed, the install utility will remove them before installing the new driver. To remove the old driver successfully, **it is essential** that the Handyscope HS3 is disconnected from the computer prior to starting the driver install utility. When the Handyscope HS3 is used with an external power supply, this must be disconnected too.

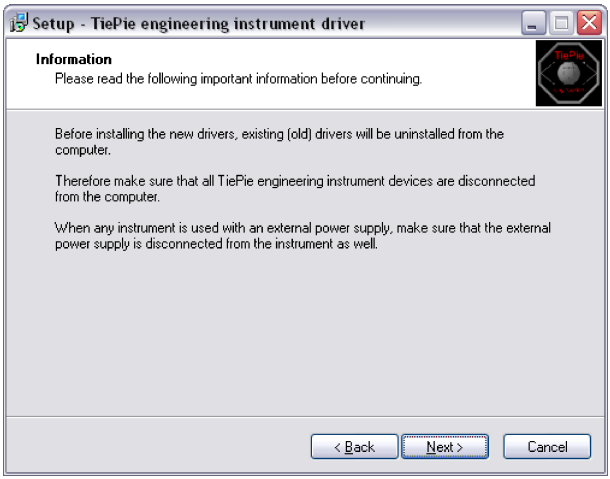
Setup - TiePie engineering instrument driver
Information
Please read the following important information before continuing.
Before installing the new drivers, existing (old) drivers will be uninstalled from the computer.
Therefore make sure that all TiePie engineering instrument devices are disconnected from the computer.
When any instrument is used with an external power supply, make sure that the external power supply is disconnected from the instrument as well.
< Back
Next >
Cancel

Figure 4.2: Driver install: step 2

When the instrument is still connected, the driver install utility will recognize it and report this. You will be asked to continue anyway.

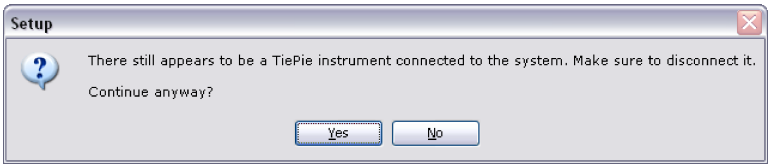
Setup
There still appears to be a TiePie instrument connected to the system. Make sure to disconnect it.
Continue anyway?
Yes
No

Figure 4.3: Driver install: Instrument is still connected

Clicking *"**No**"* will bring back the previous screen. The instrument should now be disconnected. Then the removal of the existing driver can be continued by clicking *"**Next**"*.
Clicking *"**Yes**"* will ignore the fact that the instrument is still connected and continue removal of the old driver. This option is **not** recommended, as removal may fail, after which installation of the new driver may fail as well.
When no existing driver was found or the existing driver is removed, the location for the pre-installation of the new driver can be selected.

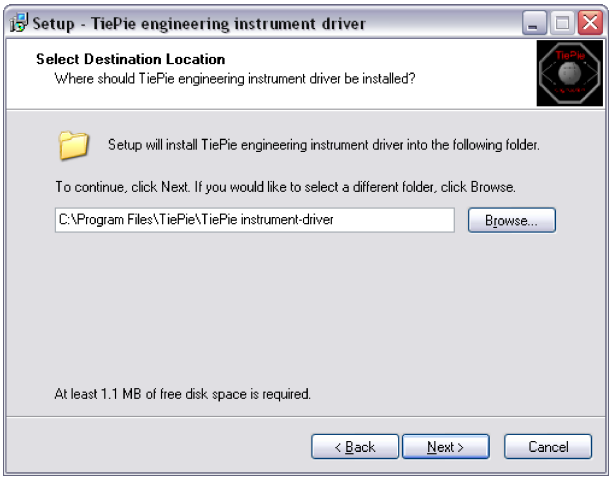
Setup - TiePie engineering instrument driver
Select Destination Location
Where should TiePie engineering instrument driver be installed?
Setup will install TiePie engineering instrument driver into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
C:\Program Files\TiePie\TiePie instrument-driver
Browse...
At least 1.1 MB of free disk space is required.
< Back
Next >
Cancel

Figure 4.4: Driver install: step 3

On Windows XP and newer, the installation may inform about the drivers not being "Windows Logo Tested". The driver is not causing any danger for your system and can be safely installed. Please ignore this warning and continue the installation.

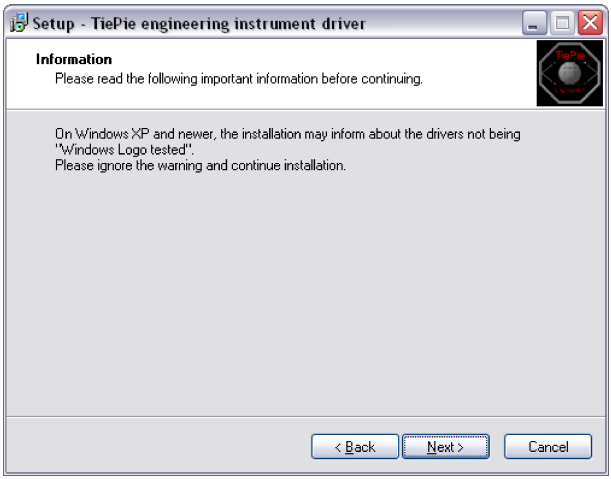
Setup - TiePie engineering instrument driver
Information
Please read the following important information before continuing.
On Windows XP and newer, the installation may inform about the drivers not being "Windows Logo tested".
Please ignore the warning and continue installation.
< Back
Next >
Cancel

Figure 4.5: Driver install: step 4

The driver install utility now has enough information and can install the drivers. Clicking *"**Install**"* will remove existing drivers and install the new driver. A *remove entry* for the new driver is added to the software applet in the Windows control panel.

Setup - TiePie engineering instrument driver
Ready to Install
Setup is now ready to begin installing TiePie engineering instrument driver on your computer.
Click Install to continue with the installation, or click Back if you want to review or change any settings.
Destination location:
C:\Program Files\TiePie\TiePie instrument-driver
< Back
Install
Cancel

Figure 4.6: Driver install: step 5

As mentioned, Windows XP SP2 and newer may warn for the USB drivers not being Windows Logo tested. Please ignore this warning and continue anyway.

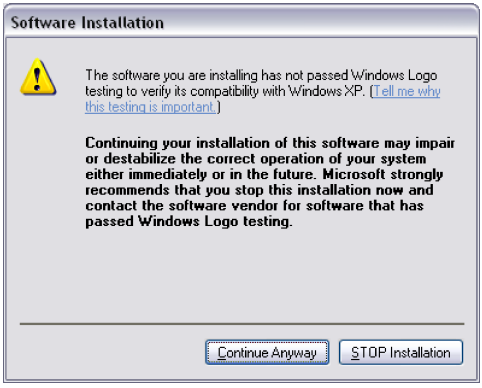
Software Installation
The software you are installing has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the software vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

Figure 4.7: Driver install: Ignore warning and continue

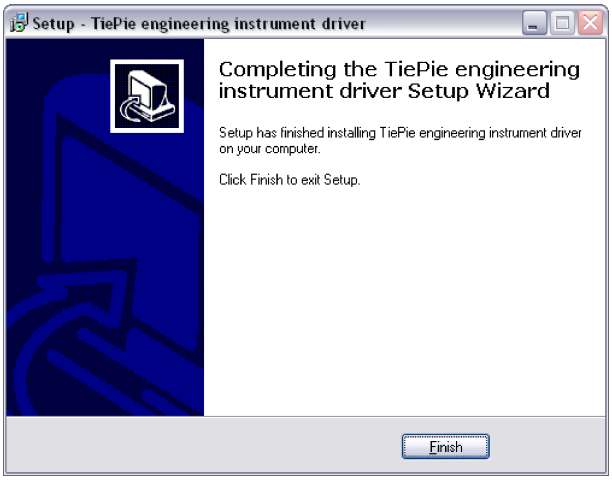
Setup - TiePie engineering instrument driver
Completing the TiePie engineering instrument driver Setup Wizard
Setup has finished installing TiePie engineering instrument driver on your computer.
Click Finish to exit Setup.
Finish

Figure 4.8: Driver install: Finished

Hardware installation 5

Drivers have to be installed before the Handyscope HS3 is connected to the computer for the first time. See chapter 4 for more information.

5.1 Power the instrument

The Handyscope HS3 is powered by the USB, no external power supply is required. Only connect the Handyscope HS3 to a bus powered USB port, otherwise it may not get enough power to operate properly.

5.1.1 External power

In certain cases, it can be that the Handyscope HS3 cannot get enough power from the USB port.
When a Handyscope HS3 is connected to a USB port, the hardware will be powered, resulting in an inrush current, which is higher than the nominal current. After the inrush current, the current will stabilize at the nominal current.
USB ports have a maximum limit for both the inrush current peak and the nominal current. When either of them is exceeded, the USB port will be switched off. As a result, the connection to the Handyscope HS3 will be lost.
Most USB ports can supply enough current for the Handyscope HS3 to work without an external power supply, but this is not always the case. Some (battery operated) portable computers or (bus powered) USB hubs do not supply enough current. The exact value at which the power is switched off, varies per USB controller, so it is possible that the Handyscope HS3 functions properly on one computer, but does not on another.
In order to power the Handyscope HS3 externally, an external power input is provided for. It is located at the rear of the Handy-

scope HS3. Refer to paragraph 7.1 for specifications of the external power intput.

5.2 Connect the instrument to the computer

After the new driver has been pre-installed (see chapter 4), the Handyscope HS3 can be connected to the computer. When the Handyscope HS3 is connected to a USB port of the computer, Windows will report new hardware. The Found New Hardware Wizard will appear.
Depending on the Windows version, the New Hardware Wizard will show a number of screens in which it will ask for information regarding the drivers of the newly found hardware. The appearance of the dialogs will differ for each Windows version and might be different on the computer where the Handyscope HS3 is installed.

The driver consists of two parts which are installed separately.

Once the first part is installed, the installation of the second part will start automatically. Installation of the second part is identical to the first part, therefore they are not described individually here.

5.2.1 Found New Hardware Wizard

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Read our privacy policy
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

Figure 5.1: Hardware install: step 1

This window will only be shown in Windows XP SP2 or newer. No drivers for the Handyscope HS3 can be found on the Windows Update Web site, so select *"**No, not this time**"* and click *"**Next**"*.

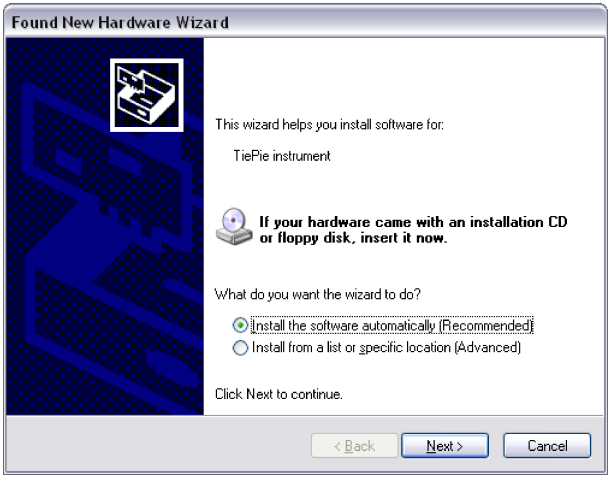
Found New Hardware Wizard
This wizard helps you install software for:
TiePie instrument
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

Figure 5.2: Hardware install: step 2

Since the drivers are already pre-installed on the computer, Windows will be able to find them automatically. Select *"**Install the software automatically**"* and click *"**Next**"*.

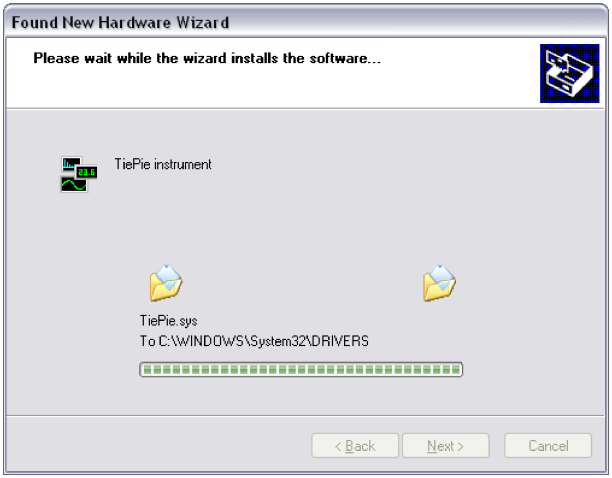

Figure 5.3: Hardware install: step 3

The New Hardware wizard will now copy the required files to their destination.

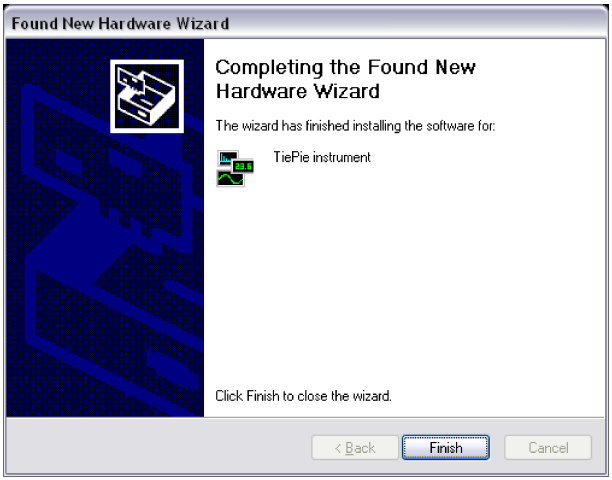

Figure 5.4: Hardware install: step 4

The first part of the new driver is now installed. Click *"**Finish**"* to close the wizard and start installation of the second part, which follows identical steps.
Once the second part of the driver is installed. measurement software can be installed and the Handyscope HS3 can be used.

5.3 Plug into a different USB port

When the Handyscope HS3 is plugged into a different USB port, some Windows versions will treat the Handyscope HS3 as different hardware and will ask to install the drivers again. This is controlled by Microsoft Windows and is not caused by TiePie engineering.

Front panel 6

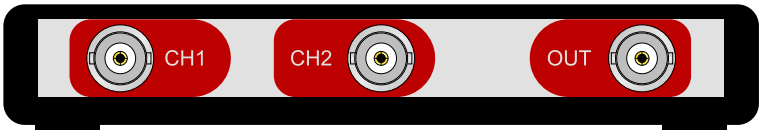

Figure 6.1: Front panel

6.1 CH1 and CH2 input connectors

The CH1 and CH2 BNC connectors are the main inputs of the acquisition system. The outside of the BNC connectors is connected to the ground of the Handyscope HS3. Connecting the outside of the BNC connector to a potential other than ground will result in a short circuit that may damage the device under test, the Handyscope HS3 and the computer.

6.2 GENERATOR output connector

The OUT BNC connector is the output of the internal Arbitrary Waveform Generator. The outside of this BNC connector is connected to the ground of the Handyscope HS3.

6.3 Power indicator

A power indicator is situated at the top cover of the instrument. It is lit when the Handyscope HS3 is powered.

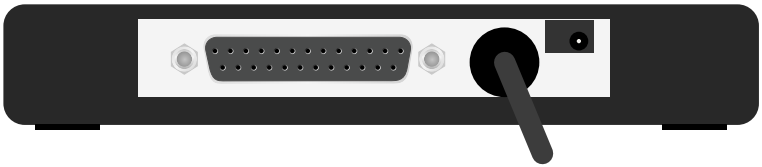

Figure 7.1: Rear panel

7.1 Power

The Handyscope HS3 is powered through the USB. If the USB cannot deliver enough power, it is possible to power the instrument externally. The Handyscope HS3 has two external power inputs located at the rear of the instrument: the dedicated power input and a pin of the extension connector.

Handyscope HS3's with SN# 11832 and lower do not have a dedicated power input at the rear, they only have an external power input on the extension connector.

The specifications of the dedicated power connector are:

Pin	Dimension	Description
Center pin	Ø1.3 mm	ground
Outside bushing	Ø3.5 mm	positive

Figure 7.2: Power connector

Besides the external power input, it is also possible to power the instrument through the extension connector, the 25 pin Sub-D connector at the rear of the instrument. The power has to be applied to pin 3 of the extension connector. Pin 4 can be used as ground.

The following minimum and maximum voltages apply to both power inputs:

	Minimum	Maximum
SN# <12941	4.5 Volt DC	6 Volt DC
SN# >12941	4.5 Volt DC	12 Volt DC

Table 7.1: Maximum voltages

Note that the externally applied voltage should be higher than the USB voltage to relieve the USB port.

7.1.1 USB power cable

The Handyscope HS3 is delivered with a special USB external power cable.

Figure 7.3: USB power cable

One end of this cable can be connected to a second USB port on the computer, the other end can be plugged in the external power input at the rear of the instrument. The power for the instrument will be taken from two USB ports of the computer.

The outside of the external power connector is connected to +5 Volt. In order to avoid shortage, first connect the cable to the Handyscope HS3 and then to the USB port.

7.1.2 Power adapter

In case a second USB port is not available, or the computer still can't provide enough power for the instrument, an external power adapter can be used. When using an external power adapter, make sure that:

- the polarity is set correctly
- the voltage is set to a valid value for the instrument and higher than the USB voltage
- the adapter can supply enough current (preferably >1 A)
- the plug has the correct dimensions for the external power input of the instrument

7.2 USB

The Handyscope HS3 is equipped with a USB 2.0 High speed (480 Mbit/sec) interface with a fixed cable with type A plug. It will also work on a computer with a USB 1.1 interface, but will then operate at 12 Mbit/sec.

7.3 Extension Connector

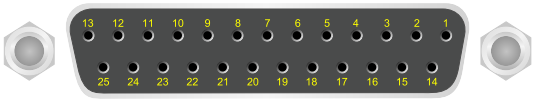

Figure 7.4: Extension connector

To connect to the Handyscope HS3 a 25 pin female Sub-D connector is available, containing the following signals:

Pin	Description	Pin	Description
1	Ground	14	Ground
2	Reserved	15	Ground
3	External Power in DC	16	Reserved
4	Ground	17	Ground
5	+5V out, 10 mA max.	18	Reserved
6	Ext. sampling clock in (TTL)	19	Reserved
7	Ground	20	Reserved
8	Ext. trigger in (TTL)	21	Generator Ext Trig in (TTL)
9	Data OK out (TTL)	22	Ground
10	Ground	23	I^2C SDA
11	Trigger out (TTL)	24	I^2C SCL
12	Reserved	25	Ground
13	Ext. sampling clock out (TTL)		

Table 7.2: Pin description Extension connector

All TTL signals are 3.3 Volt TTL signals which are 5 Volt tolerant, so they can be connected to 5 Volt TTL systems.
For instruments with serial number 14266 and higher, pins 9, 11, 12, 13 are open collector outputs. Connect a pull-up resistor of 1 kOhm to pin 5 when using one of these signals. For older instruments, the outputs are standard TTL outputs and no pull-up is required.

8.1 Acquisition system

Number of input channels		2 analog
Ch1, Ch2		BNC
Maximum sampling rate	12 bit	5 MS/s, 10 MS/s, 25 MS/s or 50 MS/s
	14 bit	3.125 MS/s
	16 bit	195 kS/s
	8 bit	100 MS/s
Sampling source		internal quartz, external
Accuracy		±0.01%
Stability		±100 ppm over −40°C to +85°C
Memory		128 kSamples per channel (256 kSamples with disabled generator)

8.2 BNC inputs Ch1, Ch2

Measure mode	Single ended
Resolution	8, 12, 14, 16 bit user selectable
Accuracy	0.2% ± 1 LSB
Sensitivity	200 mV .. 80 V full scale
Coupling	AC/DC
Impedance	1 MΩ / 30 pF
Maximum voltage	200 V (DC + AC peak <10 kHz)
Maximum voltage 1:10 probe	600 V (DC + AC peak <10 kHz)
Bandwidth (-3dB)	DC to 50 MHz
AC coupling cut off frequency (-3dB)	±1.5 Hz

8.3 Trigger system

System	digital, 2 levels
Source	CH1, CH2, digital external, AND, OR, AWG Start, AWG Stop, AWG New period
Trigger modes	rising slope, falling slope, inside window, outside window
Level adjustment	0–100% of full scale
Hysteresis adjustment	0–100% of full scale
Resolution	0.025 % (12 bits)
Pre trigger	0–128 ksamples (0–100%, one sample resolution)
Post trigger	0–128 ksamples (0–100%, one sample resolution)
Digital external trigger	
Input	extension connector
Sensitivity	0 .. 5 V (TTL)
Coupling	DC

8.4 Arbitrary Waveform Generator

Output channel	1 analog, BNC
Resolution	14 bit @ 50 MS/s
Amplitude	-12 V .. 12 V
Amplitude step	0–±0.1 V range, 12 bit resolution ±0.1–±0.9 V range, 12 bit resolution ±0.9–±12 V range, 12 bit resolution
Coupling	DC
Impedance	50 Ω
Bandwidth	DC to 2 MHz
DC level	0–±12 V, 12 bit resolution
Maximum sampling rate	500 MHz
Sampling source	internal, 0.01%
Memory	256k points
Waveforms	sine, triangle, square, DC, noise and user defined
Symmetry	0 - 100%

8.5 Interface

Interface	USB 2.0 High Speed (480 Mbit/s) (USB 1.1 Full Speed (12 Mbit/sec) compatible)

8.6 Power

Input	from USB or external input
Consumption	500 mA max

8.7 Physical

Instrument height	25 mm / 1.0”
Instrument length	170 mm / 6.7”
Instrument width	140 mm / 5.2”
Weight	480 gram / 17 ounce
USB cord length	1.8 m / 70”

8.8 I/O connectors

Ch1–Ch2	BNC
Generator out	BNC
Power	3.5 mm power socket
Extension connector	Sub-D 25 pins female

8.9 System requirements

PC I/O connection	USB 2.0 High Speed (480 Mbit/s) (USB 1.1 Full Speed (12 Mbit/sec) compatible)
Operating System	Windows 98/ME/2000/XP/Vista-32

8.10 Operating environment

Ambient temperature	0 - 55°C
Relative humidity	10 to 90% non condensing

8.11 Storage environment

Ambient temperature	-20 - 70°C
Relative humidity	5 to 95% non condensing

8.12 Certifications and Compliances

CE mark compliancee	Yes
RoHS	Yes

8.13 Package

Instrument	Handyscope HS3
Probes	2 x 1:1 / 1:10 switchable
Accessories	PS2 power cable
Software	Windows 98/2000/ME/XP/Vista-32
Drivers	Windows 98/2000/ME/XP/Vista-32
Manual	Instrument manual and software user's manual

If you have any suggestions and/or remarks regarding this application or the manual, please contact:

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